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## AN ANALYSIS OF THE OPTICAL SCANNER LASER DISK ARCHIVAL RETRIEVAL SYSTEM

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THE OFFICE OF THE CHIEF OF CHAPLAINS, UNITED STATES ARMY

BY

CHAPLAIN (LTC) JAMES B. LONERGAN

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**USAWC Military Studies Program Paper**

**AN ANALYSIS OF  
THE OPTICAL SCANNER LASER DISK  
ARCHIVAL RETRIEVAL SYSTEM  
FOR  
THE OFFICE OF THE CHIEF OF CHAPLAINS  
UNITED STATES ARMY**

**An Individual Study**

**By**

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Carlisle Barracks, PA 17013  
17 March 1990**

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## ABSTRACT

AUTHOR: James B. Lonergan, Chaplain, LTC

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## Chapter One

### INTRODUCTION

In a period of restrained resources the Department of the Army is seeking every possible way to stretch available dollars to meet essential objectives. The dawn of the Information Age has made the Army aware of the tremendous possibilities available to reduce manhours and to obtain more precise facts in a faster manner. Much of the Army's administrative requirements revolve around the collection, manipulation and utilization of data. For much of the Army's history this data has been processed manually. Computerization has allowed many aspects of this process to be speeded up. Unfortunately -- up to now -- someone has had to manually type in the data. With the development of the Optical Scanner Laser Disk Archival Systems we have now reached the point where much of the manual input can be eliminated.

### PROJECT HYPOTHESIS

This study is an analysis of the Optical Scanner Laser Disk Archival Retrieval System developed by the Science Application International Corporation (SAIC) for the United States Army War College and its possible application to automating the functions of filing, storing and retrieving the archives of the Office of



the Chief of Chaplains, United States Army.

PROJECT OBJECTIVE

1. Explain the types of documents that exist in the archives of the Chief of Chaplains, United States Army.

2. Illustrate the interface of the Archives of the Office of the Chief of Chaplains, United States Army, with other functional areas in the Chaplaincy.

3. Illustrate how archival documents are filed, stored, and retrieved within Department of the Army requirements for software.

4. Analyze the United States Army War College Optical Disk System and its application to the Archives of the Office of the Chief of Chaplains, United States Army.

5. Create a database of 7200 optically scanned pages stored on a series of laser disks in such a manner that the data can be retrieved via subject, word and/or concept index.

6. Discuss further applications and strategic implications of this system to other administrative functions conducted within the United States Army.

### ASSUMPTIONS AND LIMITATIONS

The referenced material in this study is assumed to be accurate given the rapidly developing technology involved. This study has been limited to the United States Army War College Optical Disk System which is considered to be the current "state of the art" type of the fielded versions of such systems. Time and fiscal restraints have forced the narrowing of the focus of this study to the Optical Disk System. Other systems, such as microfilming, have been researched in detail by others.

### CRITERIA FOR THE SYSTEM

The following criteria have been identified as establishing the parameters for judging the Optical Disk System:

1. Turn around time: This is the time it takes to validate a document and place it in a file.
2. Retrieval capability: Defined as the time, effort, or ease involved in pulling a document from storage for future reference. This also includes capability of indexing.
3. Storage capacity: The capacity of the system to store large amounts of data.

4. Horizontal resolution: The ability of the equipment to produce a sharp and clear picture.

5. File integrity: The system's capability to ensure that all required documents are maintained accurately and not misfiled or lost.

6. Access time: The time it takes to access the files.

7. Cost to store information: This is the cost per byte to store information.

8. Interface capability: The ability of the system to be connected to a mainframe computer.

9. Education: Defined as the minimum amount of training that personnel need to do their job effectively.

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'Major Edgbert Alford, "Automating the Document Control Section of Base Supply." Thesis. Air Command and Staff College: Maxwell Air Force Base, Alabama, April 1987, p. 3.

## Chapter Two

DEPARTMENT OF THE ARMY INFORMATION  
MANAGEMENT GUIDANCE AS IT APPLIES  
TO THIS PROJECT

The Department of the Army has become a leading user of computer technology. Many of the basic computer concepts were developed in conjunction with various military weapons systems. The use of computer technology in the field of administration is still fairly new. With the development of the Personal Computer and its rapid dissemination among military personnel as well as the civilian population, it soon became apparent that many administrative and bookkeeping functions could be more accurately and efficiently handled with computer technology.

Many areas within the Army began to develop and use computer technology. Initially there was no common approach. There was also no guidance from Department of the Army level standardizing various software applications, etc. In 1987 the Army began a process of buying large numbers of Personal Computers for use in administrative functions. The main contract for this package went to the Zenith Corporation for both table top and laptop PCs.

It soon became apparent that there was a need for some consistency across the Army and so a series of publications was developed standardizing Information Management within the Army. From now on any utilization of computer technology in the Army

Will need to keep the Army's basic computer technology standards in mind.

The bottom line in the Army's approach to standardization in computer technology is that each of the various pieces of computer technology that are developed must be able to interface with the rest of the system. It was found, for example, that large amounts of data collected in the logistics area was unable to be used with data from the personnel area because of incompatibility between the computer software. Files developed in one area could not be used in other areas due to computer language problems. We were fast creating a modern Tower of Babel and needed to get a handle on the situation before it became more complicated. The Information Mission Area (IMA) cycle (Figure 2-1) was developed to facilitate the Army Information Management System asking the right questions in the process of answering users requirements.

The Army is concerned that in an era of peace, we will be able to enter rapidly into a transition phase to conflict and to conflict itself. This includes developing computer technology that can make the transition.<sup>1</sup> This means that every aspect of computer technology developed must be designed "for flexibility, growth, survivability, supportability, and security."<sup>2</sup>

The Optical Scanner/Laser Disk Archival Retrieval System has been designed to comply with all current Army regulations. It is an extremely flexible system, designed for continual growth. One

of the driving forces behind developing the AWC Optical Scanner/Laser Disk Archival Retrieval System was its ultimate survivability. This system can operate as a "stand alone" system or as part of a "network" of systems. Current technology allow this system to be a part of a supporting network of systems and the system itself can support a host of different computer systems currently in operation or planned for the future. The compactness of the disks, their virtual indestructibility, and their ability to be easily secured mean that this system can pass the security test.

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<sup>1</sup>U.S. Department of the Army, DA Memo 25-2: Information Management. Washington: 10 July 1989, 7(c), p. 9.

<sup>2</sup>Ibid. 7(d), p. 9.

## Chapter Three

### THE SAIC SOFTWARE PACKAGE: AN EVALUATION

#### INTRODUCTION

The AWC Optical Scanner/Laser Disk Archival Retrieval System was designed to meet the specific needs of the Army War College. It was also designed to interface with other operating systems and the software can be reconfigured to meet other military needs. As impressive as this system is in operation, it is the software that enables the hardware to function. It is evident from the current utilization of the system that it has achieved its objective of enabling documents to be quickly and correctly stored and to be efficiently retrieved. This evaluation will look at four areas: the operating system; the system drivers software, the database management software; and the applications software. The software must be capable of processing documents through the various procedures involved in the process: scanning, archiving, distribution and retrieval of the documents.

#### OPERATING SYSTEM

The operating system is the heart of any computer. It serves as the link between the hardware and the application software. It performs the following:

- (1) Translates commands from application and driver software into specific hardware instructions.
- (2) Regulates the flow of information among the peripherals and through the central processing unit (CPU).
- (3) Provides an interface between the operator (or application software) and the peripherals.
- (4) Allocates hardware resources for a specific task.
- (5) Provides an overall framework for the organization of program and data files.

The disk operating system is characteristic of the computer it is designed to serve. Today the majority of computers follow either Microsoft's Disk Operating System (MS DOS) or the UNIX system developed by AT&T. Most Army computers use some version of MS DOS and that is the case with the AWC Optical Scanner/Laser Disk Archival Retrieval System. The version of DOS is not as important as the compatibility of the software on various machines to utilize the files produced. Most systems now use some form of ASCII text to transfer files from one system to another. The AWC system is capable of transferring files to other systems and receiving files from other systems.



### SYSTEM DRIVERS SOFTWARE

This system uses a series of software drivers to control the system hardware. They are:<sup>2</sup>

- (1) The Control Panel Driver
- (2) The Monitor Controller Driver
- (3) The Printer Controller Driver
- (4) The Scanner Controller Driver
- (5) The Hard Disk Controller Driver
- (6) The WORM Controller Driver

The primary purpose of the software drivers is to provide an interface between the operating system and the peripherals of the system. Drivers allow systems to be tailored for specific needs. The drivers designed for this system allow the system to perform in an exemplary manner.

### DATABASE MANAGEMENT SOFTWARE

The database software designed for this system was created using a Unify software program package. It was designed to handle large document file databases with speed and efficiency. This particular software performs a variety of document processing tasks.

### APPLICATION SOFTWARE

The applications software programs for this system fall into four categories:<sup>3</sup>

(1) Processing Control - AWC.EXE: This is the main control program which operates database files. It keeps tracks of document file locations, tracks the active status of each document, and provides the system operator with user friendly software interface.

2. Imaging System Control Program - EDIT-IMG.EXE: This program allows the user integrated access to the digital scanner, laser printer, image compression/decompression boards and high resolution display system as a production document capture system; and provides an audit trail for tracking documents that have been scanned by the database.

3. Retrieval Program - AWC-RETV.EXE: This program provides different search and display capabilities to the user.

4. Optical Disk Utility - LFORMAT.EXE: This program is used by the system to initialize new optical cartridges.

### CONCLUSION

The software designed for the Optical Fiber Laser Disk Archival Retrieval System is capable of accomplishing the objectives established by the Chief of Chaplains Office. It can safely, accurately, and efficiently archive vast amounts of information. The information is then available to be retrieved quickly and accurately using a variety of indexes. This software can be adjusted within time and fiscal constraints to accomplish the archival needs of the Chief of Chaplains.

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<sup>1</sup>Barry Cinnamon, Optical Disk Document Storage & Retrieval Systems. Silver Spring, Maryland: Association for Information and Image Management, 1988, p. 53.

<sup>2</sup>SAIC, MMESI/AWC Optical Disk System. McLean, Virginia, September 1989, p. 14.

<sup>3</sup>Ibid., p. 12.

## Chapter Four

## THE OPTICAL SCANNER/ LASER DISK HARDWARE

INTRODUCTION

In 1987 there were twenty five million personal computers in use in the United States. Of these, four hundred thousand were within the federal government. This is double the 1986 figure. There are also about fifty thousand personal computers in use in eighty thousand libraries in the United States.<sup>1</sup> Libraries have led the way in encouraging the development of optical scanner laser disk archival retrieval systems.

Optical laser disk technology makes possible the storage of a wide variety of data on a disk about five and one quarter inches in diameter. The optical storage disk is similar to the commercially available compact disks.

Unlike traditional computer storage devices which use a magnetic field and magnetic heads to capture data, the optical laser disk uses light energy to store data on rotating disks. A moving mirror and lens system focuses the light from a stationary laser onto the disk. A normal five and one quarter inch optical disk can hold as much data as about 1500 floppy magnetic disks or 270,000 pages of text.<sup>2</sup> The surface of the disk is coated with a medium -usually shiny aluminum -capable of interacting with laser

light of appropriate energy. Most laser systems record data by creating a high energy laser beam. The data is then read by reflecting low energy light from the same laser off the surfaces.

From an archival standpoint, optical memory technology is unique. It is the only storage medium capable of storing video, audio and digital data. While this study is limited to digital storage, the application of the technology to the audio and video areas opens up some phenomenal possibilities for future studies.

The optical disk is the only medium currently available that can retrieve archival data constantly without reducing the quality of the data. The technology even exists today of storing handwritten documents and documents with signatures. Only documents written on rag paper or parchment can be stored longer than data placed on optical disks.<sup>3</sup>

There are several types of optical disk systems available. The three main ones are 1. The Read Only System; 2. The Write Once, Read Many Times System (WORM); and the Write Many, Read Always System (WMRA). The system that is of most interest in an archival sense is the Write Once, Read Many Times System (WORM). This study will focus on the WORM System.

#### THE WORM SYSTEM

This type of system is particularly well suited to the needs of the archival community in general and the Chief of Chaplains Office in particular. It has the capability of protecting

historical data from accidental or deliberate erasure or change. It - on the other hand - allows easy retrieval of the original data. This system is best suited for collected data that rarely has to be changed. Historical documents, military regulations, and legal briefs are examples of data that fit this system.

The WORM System allows data to be placed on optical disk from a local work station by an operator who can be trained very quickly to operate the equipment.

#### ADVANTAGES OF THE WORM OPTICAL DISK SYSTEM\*

The optical laser disk has several advantages over microfilming. This system allows for faster access and retrieval. It can typically store and retrieve a standard letter within five seconds. It also allows for extremely high density storage. As many as 60,000 documents, the equivalent of twenty file drawers, can be stored in less than one hundred cubic inches. The total file stored is always available. This eliminates out of file misfiles or lost items. Whenever you are storing data in an archival system, there is concern for total file integrity. Misplaced bits of information can destroy the other advantages of the system. Optical filing systems capture all the information in a document and maintain the quality of the original. The write-once disk information is non-erasable. The information is stored below the disk surface, substantially reducing errors related to surface scratches, smudges, and fingerprints. The system allows for easy file entry and quick

retrieval of documents. Optical disk filing systems store records at an extremely low cost (less than ten cents per megabyte). The optical resolution available with the laser disk is far greater than the resolution available in other storage media.

Optical disks are also small, taking up less physical room than microfilming equipment, for example. Optical disks are more accurate and more reliable than other storage media since they have fewer mechanical parts.

There are very few disadvantages to using the Optical Laser Disk. The two main disadvantages are: 1. Data can be updated on the WORM system only by rewriting the entire updated data onto a new disk or an unused portion of the original disk and 2. special equipment must be purchased to read the disks.

#### THE OPTICAL SCANNER/ LASER DISK SYSTEM

To utilize this system a Microcomputer with an 80386 Central Processing Unit (CPU), a 1.2 Megabyte Floppy Disk Drive and a 130 Megabyte Hard Disk are required. (See Figure 4.1) There is also a requirement for an Optical Storage Device with a Laser Drive 5.25 Dual Drive WORM subsystem with an 1.6 Gigabyte capacity. A High Resolution Display Subsystem is required with a LV-610 Monitor Controller; a LV-0630 Decompression Processor; and a LV-7000 High Resolution Monitor. The Scanner Subsystem requires a LV-810 Compression Processor and a Ricoh IS-400 Scanner with automatic document feed. The laser printer subsystem requires a Ricoh LP-4080E Laser Printer and a LV-620 Laser Printer

Controller. The following definitions explain the various subsystems of the Optical Scanner/Laser Disk main system.

#### PC-386 Compatible Microprocessor Controller

The Microprocessor Controller establishes an interface between the disk drive and the control computer.<sup>5</sup> (See Figure 4.2).

#### 130 MB Internal Hard Drive

A hard disk drive is a requirement of this system. All system, database and utility software is maintained on the hard drive. The hard disk is also used as a temporary holding area for data before it is permanently written to the optical disk; for storage of identification and location information for multiple disks; and for storage of database index information.<sup>6</sup>

#### High Resolution Video Display Monitor

The display of document images on a monitor makes the entire concept of paperless document retrieval and processing possible. Monitors are required to display a wide variety of documents, from images of typed business correspondence to photographs. However, they are used not only as document display devices, but also



for the display of textual (ASCII format) information.<sup>7</sup> (See Figure 4.3).

#### 5.25-inch Dual Optical Drive Storage Device

Optical drives are becoming increasingly important as data storage devices because they have extremely high storage densities and use removable and durable media.<sup>8</sup> (See Figure 4.4).

#### 1.2 MB Floppy Disk Drive

External floppy disk drives are used primarily for backup of system and database software as well as software input devices.<sup>9</sup>

#### Digital Scanner with Automatic Document Feeder

Document scanners are in the front end of document storage and retrieval systems. These components convert and image that exists on paper to an electronic version that can be stored, displayed and printed.<sup>10</sup> (See Figure 4.5).

#### Laser Printer

Laser printers use a laser or reflected light to create a temporary (latent) image on a photosensitive media corresponding to the document to be copied or

printed. The latent image is then developed by applying toner. The developed image is transferred and fused to paper, after which the paper is ejected from the printer.<sup>11</sup> (See Figure 4.6).

The cost of the hardware for the Optical Scanner/Laser Disk Archival Retrieval System is estimated in today's dollars to be \$50,000.00 for the master scanning (production) system and \$26,000.00 for each Read Only System. The Read Only Systems can be established at a distance from the master system and connected via modem.

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<sup>1</sup>Linda W. Helgerson, "Strategic Analysis of the CD-ROM Industry," 4 March 1988, p. 1.

<sup>2</sup>Nancy M. Nelson, "Alexandria," CD ROM Review, Vol. 3, No. 1, February 1988, p. 44.

<sup>3</sup>Connie Zuckerman and Arthur Andersen. "Advancing Office Operations Through Optical Memory Technology." Government Executive, Vol. 16, November/December 1984, p. 49.

<sup>4</sup>Alford, Edgbert. "Automating the Document Control Section of Base Supply," Maxwell AFB, AL, April 1987, pp. 19-20.

<sup>5</sup>Barry Cinnamon, Optical Disk and Document Storage & Retrieval Systems. Silver Spring, Maryland: Association for Information and Image Management, 1988, p. 21.

<sup>6</sup>Ibid. p. 25.

<sup>7</sup>Ibid. p. 45.

<sup>8</sup>Ibid. p. 9.

<sup>9</sup>Ibid. p. 26.

<sup>10</sup>Ibid. p. 26.

<sup>11</sup>Ibid. p. 43.

## Chapter Five

### THE APPLICATION:

#### THE CHIEF OF CHAPLAINS' ARCHIVAL REQUIREMENTS

##### INTRODUCTION

The Optical Scanner Laser Disk Archival Retrieval System that has been discussed in the previous pages possesses 'state of the art' technology. It has the capability of meeting the archival needs of the Army at large and the Chief of Chaplains archival needs in particular. In this section I will discuss the unique requirements of the Chief of Chaplains Office as they apply to this system.

##### ARCHIVES IN THE CHIEF OF CHAPLAINS OFFICE

The archives housed in the Chief of Chaplains Office are primarily concerned with current Chaplain Branch operations. The historical archives of the Chaplains Branch are housed in the United States Army Chaplains Museum at Fort Monmouth, New Jersey. It is hoped that a further development of this research will lead eventually to the incorporation of the historical archives into the master database available to qualified chaplains doing research on the chaplaincy in the future.

This project is primary concerned with the legal documents that have been accumulated over the last ten years dealing with the court cases that have involved the United States Army

chaplaincy. Chaplain (BG) Israel Dressin spent several years gathering the necessary data required to meet the challenges in court on the constitutionality of the chaplaincy. The accumulated data now exceeds ten thousand pages. This archival information will form the basis of the initial utilization of the Optical Scanner/Laser Disk Archival Retrieval System for the Office of the Chief of Chaplains of the United States Army. In the day to day operation of the Chief of Chaplains Office there is a need for quick access to the documents on file to handle routine as well as extraordinary requirements for information placed on the Office of the Chief of Chaplains by various departments within the Army, as well as congressional and court requirements.

The incorporation of this data into an Optical Scanner/Laser Disk Archival Retrieval System will allow almost instantaneous availability of any document or portion of a document filed in the system compared with the dozens of manhours currently required to search manually through ten thousand pages of data to obtain the same information. The Optical Scanner/Laser Disk Archival Retrieval System allows for the indexing of every document - and the contents of the same - that is placed in the system. It is the capability of indexing the data stored that makes this system so valuable. The index becomes the gateway through which the system is able to retrieve required data in an expeditious manner.

This system is not limited to the storage of legal data. It also allows for the storage of personnel data to include all the

basic official documentation required for the life cycle model of the Chaplains Branch. This would cover such areas as personnel policy development; acquisition of new chaplains; training, distribution, deployment and utilization of chaplains; sustainment and development of chaplains; and separation of chaplains. The entire area of policy and programs can also be incorporated into this system along with all aspects of facilities and logistics. This type of system has already been utilized in the engineering field in the civilian community and offers great potential for keeping track of the various types of Chapel facilities that exist in the Army.

Chaplain (COL) Wayne Kuehne, DACH-PPDT, has developed a hard copy document entitled "UMT-RELATED ARMY REGULATIONS" which runs to about two hundred pages. This document - which is used in the day to day running of the Chaplains Branch - is an excellent example of the type of material that can be incorporated into this system and made available quickly and accurately. In the future all military regulations will be incorporated into a system like this and will be able to be accessed quickly and efficiently. This will make it possible to scan the entire library of military regulations in a matter of seconds to see if a particular subject or area is addressed anywhere in regulations and if so to have that citation flashed on a monitor screen at the touch of a button. The thousands of hours that must currently be utilized to research various matters can be drastically reduced with an associated reduction in costs.

The Optical Scanner/Laser Disk Archival Retrieval System developed by SAIC for the United States Army War College has many applications throughout the Army. It is particularly well suited to the needs of the Office of the Chief of Chaplains. Such a system can help greatly to maintain the level of efficiency required of the Office of the Chief of Chaplains in a time of severely constrained resources.

#### THE LEGAL ISSUES

Questions have arisen recently concerning the legality in court of documents that have been archived using the optical scanner laser disk technology. Many of the documents in the Chief of Chaplains Office have been compiled as the result of various legal challenges to the existence of the United States Army Chaplaincy. The United States judicial code allows original documents to be copied and then allows - in most cases - the originals to be destroyed in the normal course of business. The copies - properly identified - are admissible in court as evidence as the original would be. The most serious part of the legal decision in this matter is that the document be properly or satisfactorily identified as a true copy of the original. This can be safeguarded by following proper procedures in the archiving and indexing of the original document. The exact wording of the opinion of the chief counsel of the Internal Revenue Service is as follows:<sup>2</sup>

If any business, institution, member of a profession or calling, or any department or agency of the government, in the regular course of business or activity has kept or recorded any memorandum, writing, entry, print, representation or combination thereof, or any act, transaction, occurrence, or event, and in the regular course of business has caused any or all of the same to be recorded, copied or reproduced by any photographic, photostatic, microfilm, micro-card, miniature photographic, or other process which accurately reproduces or forms a durable medium for so reproducing the original, the original may be destroyed in the regular course of business unless its preservation is required by law. Such reproduction, when satisfactorily identified, is as admissible in evidence as the original itself in any judicial or administrative proceeding whether the original is in existence or not, and an enlargement or facsimile of such reproduction is likewise admissible in evidence if the original reproduction is in existence and available for inspection under direction of court. The introduction of a reproduced record, enlargement, or facsimile does not preclude admission of the original. This subsection shall not be construed to exclude from such evidence any document or copy thereof which is otherwise admissible under the rules of evidence.

The Optical Fiber/Laser Disk Archival Retrieval System meets all the court requirements to date. It will allow documents to be reproduced in an exact facsimile copy of the original. Such copies meet the court test to be admissible as evidence.

Currently much data that has been accumulated on magnetic tapes is being lost because the magnetic tape base is disintegrating. An advantage of the Optical Fiber/Laser Disk Archival Retrieval System is the ability of the programmed disks to last indefinitely. The longevity of the data disks together with their ability to allow almost instant access to the indexed data contained on them makes this technology timely and appropriate for the needs of the Chief of Chaplains Office and for the Army in general. Currently some of the areas in the civilian sector that are interested in the development and utilization of this technology are:<sup>3</sup> (1) Financial institutions for checking procedures; (2) Insurance companies for policy documentation, customer files and referenced documents; (3) the Medical field for patient records and diagnostic images; (4) Manufacturing for engineering drawings; (5) Publishing and Research for document storage and availability; (6) Legal for case histories; (7) Architectural for engineering drawings; and (8) Utilities for customer records and payment documents.

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<sup>1</sup>Kuehne, Chaplain (COL) Wayne, "UMT RELATED ARMY REGULATIONS", Office of the Chief of Chaplains, Washington, D.C., July 1989.  
<sup>2</sup>28 U.S.C. 1732, Internal Revenue Service Memorandum, January 5, 1983.

<sup>3</sup>A.R. Hasekamp, W. Hoekstra, and J. W. Klimbie, "The Optical Digital Data Disk for the Storage of Images of Original Documents." in Applications of Optical Digital Data Disk Storage Systems, W. Mike Deese, Marino Carasso, Editors, Proc. SPIE 490, 1984 p. 5.



## Chapter Six

### The Future: Applications of this Process to other Administrative Areas in the Army

At a time in history when the Army is being pulled in two directions: towards a smaller Army while being prepared to expand quickly if necessary, the Optical Scanner/Laser Disk Archival Retrieval System possess the technology to transform vast areas of the Army's administrative structure. The WORM system that was discussed earlier has a great deal of potential for use in many areas of the Army's administrative functions.

Permanent military records have always been a very important part of the Army's record keeping process. A permanent record is begun on each servicemember the day they sign their contract to join the Army. The Reception Centers add to that file and it continues to develop with the individual throughout his/her career. At retirement the accumulated records in the file help to determine veteran's benefits for the individual and then the file becomes part of the Army's historical database. Such permanent records are extremely important for the individuals concerned and for the Army in general. This is one area where the Optical Scanner/Laser Disk Archival Retrieval System can be of great benefit to the Army.

Financial records are also part of the permanent records that the Army keeps. An archival system can help to maintain such records in a smaller amount of space than paper or magnetic disks. It is also a faster way to retrieve such data. Engineers are responsible for a tremendous amount of property and thousands of facilities within the military inventory. This system can help to keep tabs on property and facilities for Engineering Districts as well as for the entire Army.

Property books are some of the most critical and sensitive items handled by the Army. The Optical Scanner/Laser Disk Archival Retrieval System has the capability of handling the Army's Property Book and also has the capability of not only telling the Army what it has (very quickly) but also where it is.

Education and Training Records for individuals and units are also part of the Army's permanent set of records. This system would allow such records to be kept safely and readily available when needed.

Medical records are another part of the Army's permanent record collection. Having such records instantly and correctly available can be a matter of life and death. Legal documents, such as opinions on various military matters, can also profit from such a system. The current excellent computer program that the lawyers have can be enhanced with the addition of the Optical Scanner/Laser Disk Archival Retrieval System.

There are many, many ways that the Optical Scanner/Laser Disk Archival Retrieval System can help the Army. This technology has the potential for radically changing the way that the Army performs its administrative responsibilities.

# IMA CYCLE

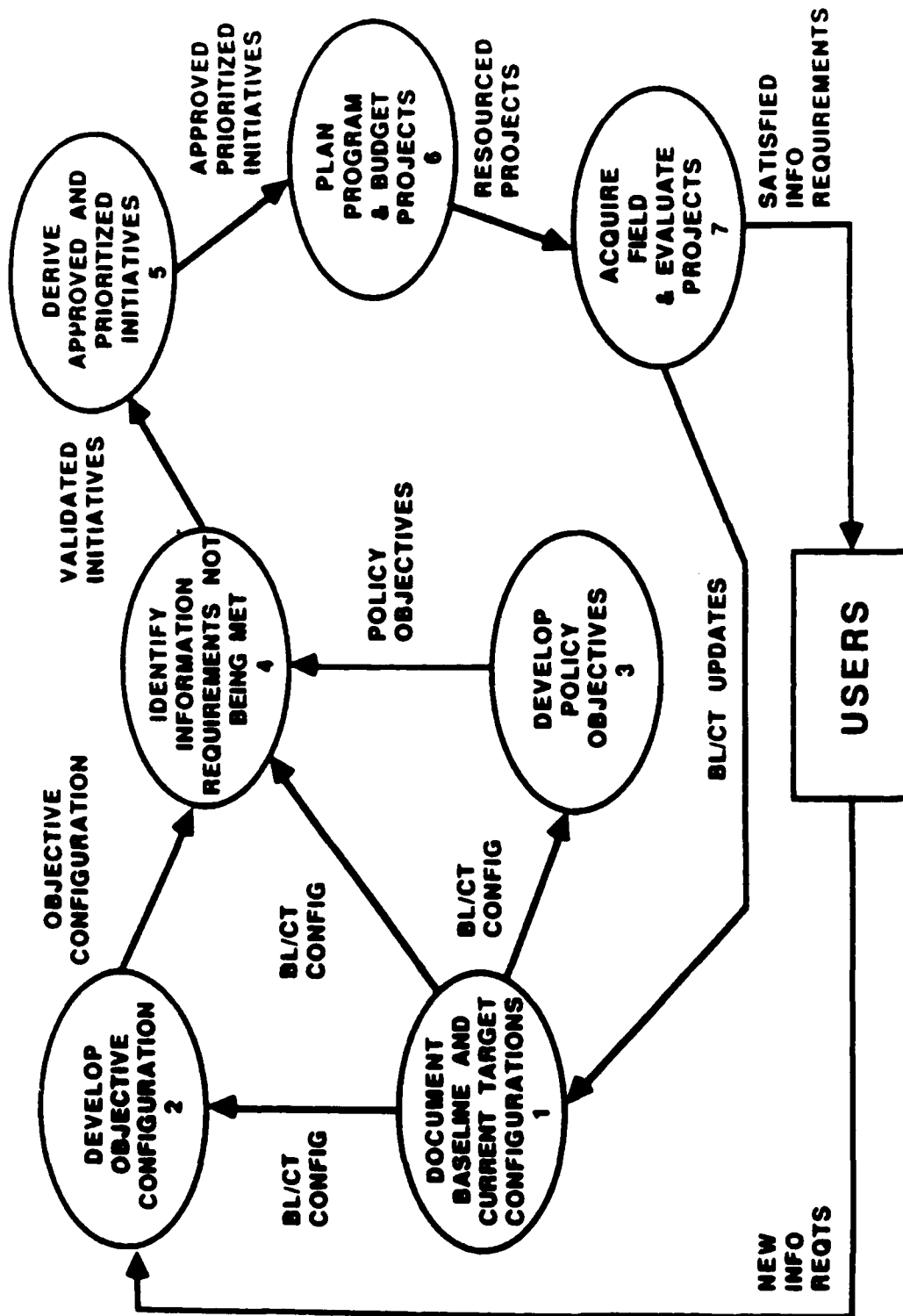
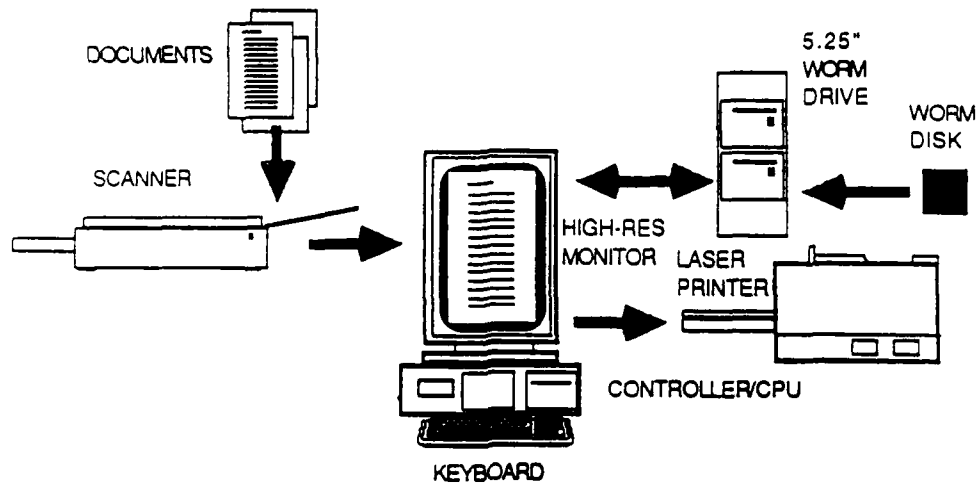


Figure 2.1

## MASTER SCANNING WORKSTATION



## RETRIEVAL WORKSTATION

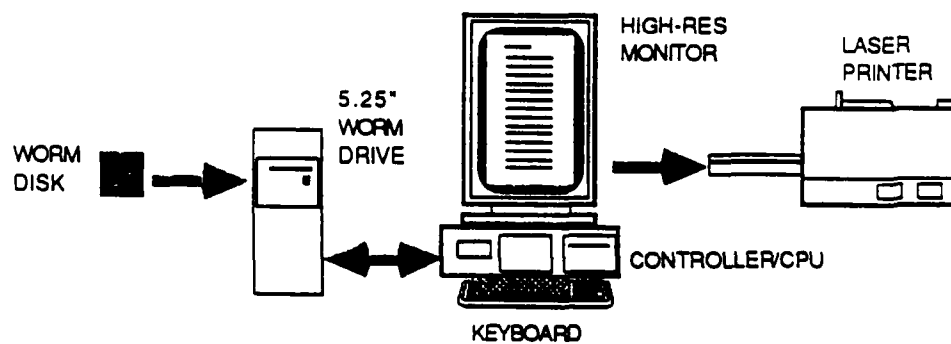
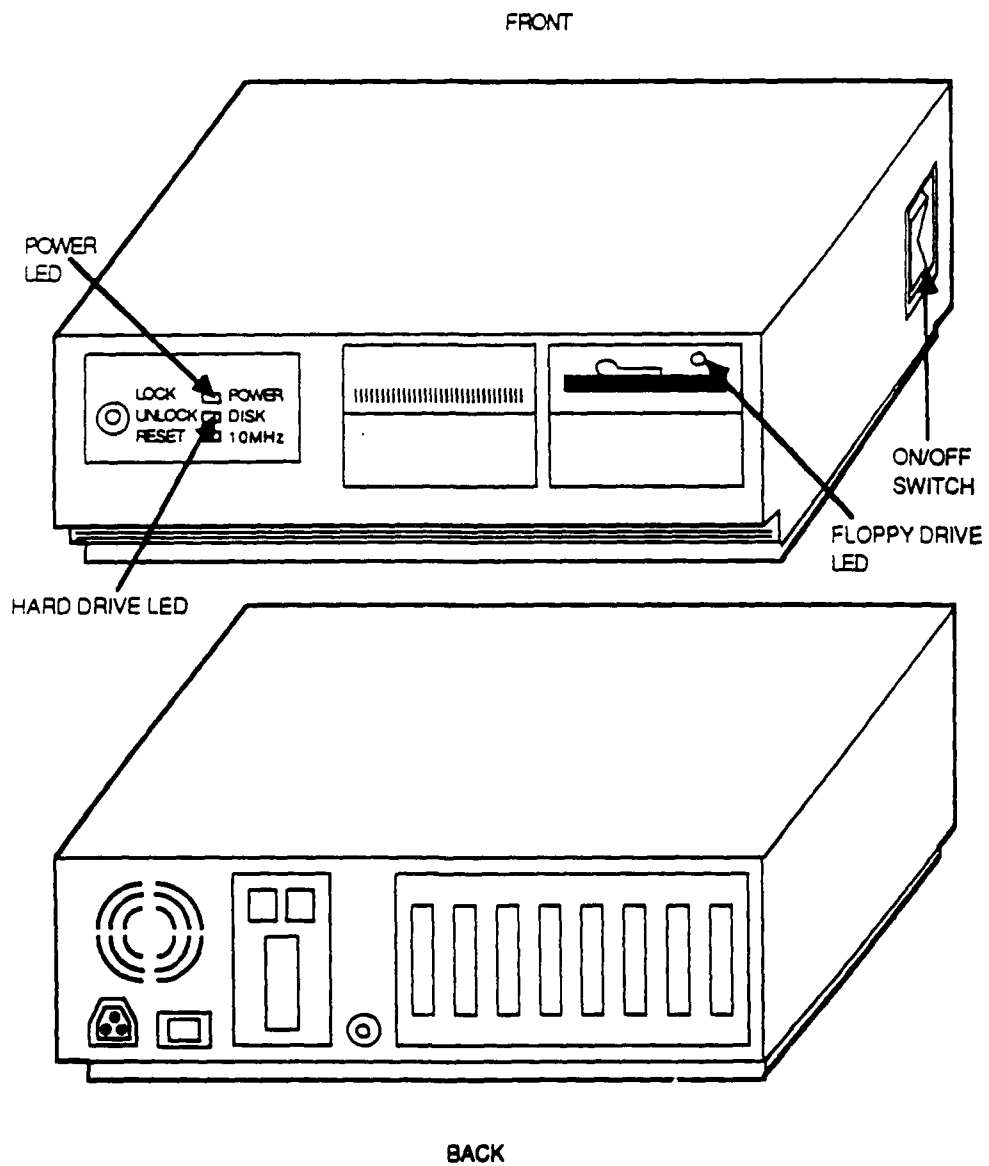


Figure 4.1



PC 386 Compatible Microprocessor Controller

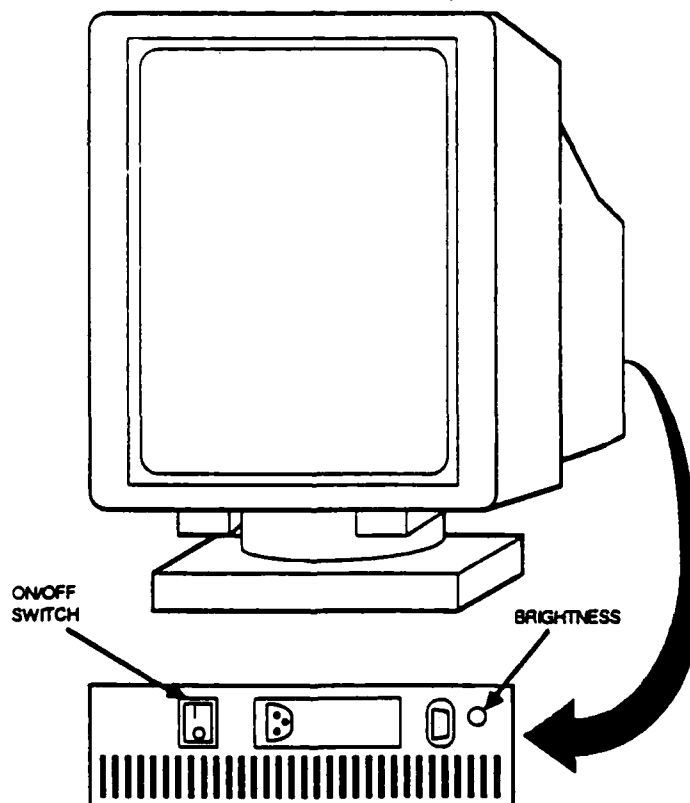
Figure 4.2

### High-Resolution Video Display Monitor

A 150 x 300 dpi monitor for viewing images and system messages.

#### Controls and Indicators:

- On/Off switch - located at the right rear of the monitor frame.
- Brightness control - is a recessed dial located at the left rear of the monitor frame.



High-Resolution Video Display Monitor

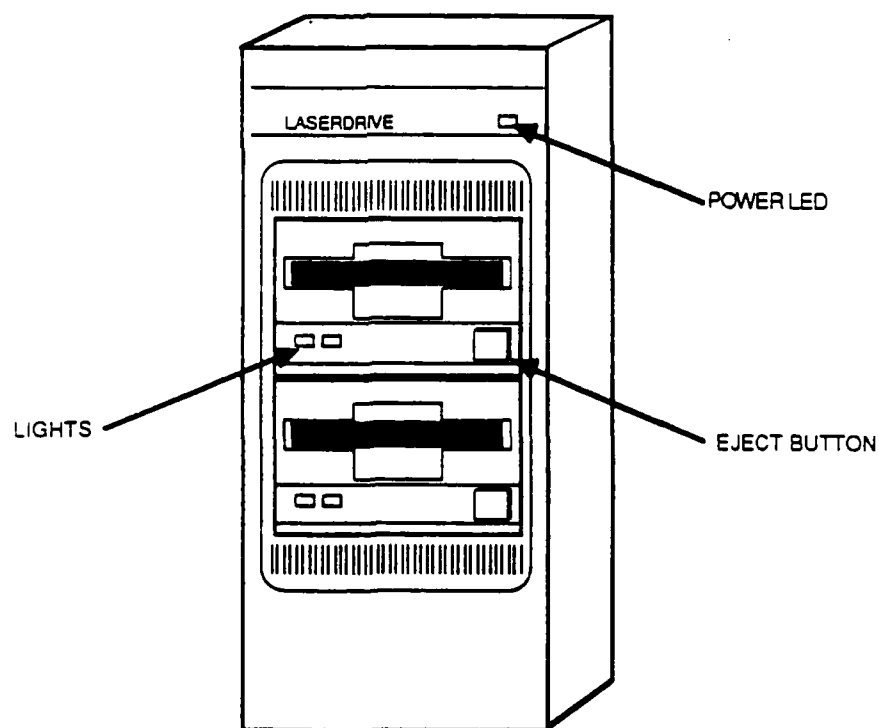
Figure 4.3

### 5 .25-inch Dual Optical WORM Disk Drive with Controller

The "write once read many" WORM drive provides 1.6 gigabytes of search and retrieval storage for the image databases per disk. This disk also used to provide copies of the master image files and act as a distribution media to a retrieval workstation.

#### Controls and Indicators:

- On/Off switch - a rocker switch located at the back of the unit.
- Control panel light indicates that the system driver is operating.
- Eject button is located on the front of each drive unit and manually ejects the cartridge from the drive.



5.25-inch Optical WORM Disk Drive with Controller

Figure 4.4

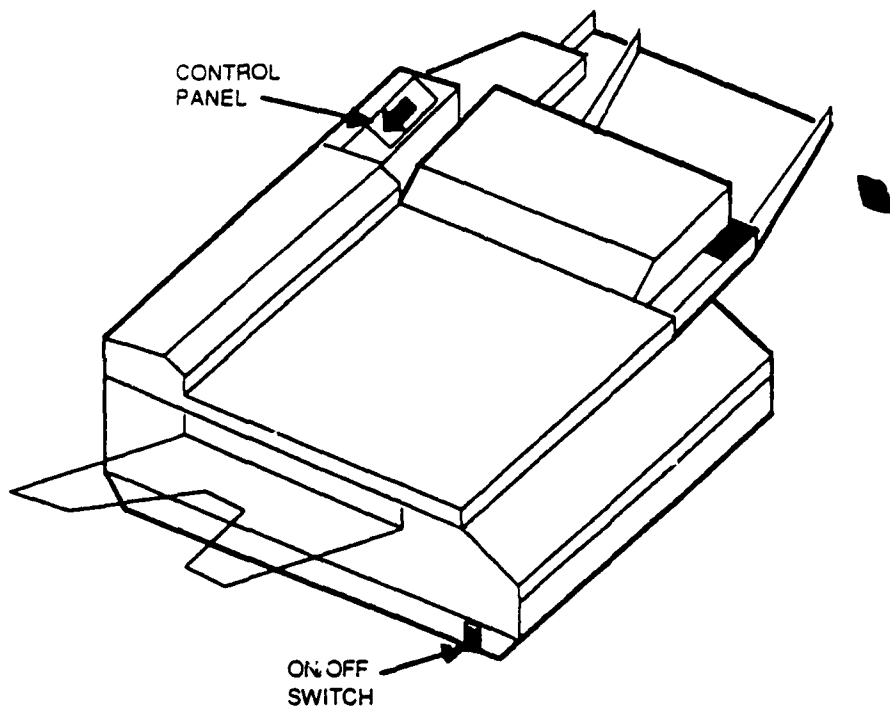


### Digital Scanner with Automatic Document Feeder

The scanner is used to digitize pages of a document to create bit-mapped images. These images are stored as image files.

#### Controls and Indicators:

- On/Off switch - a rocker switch located at the front of the left side on the scanner frame.
- Control panel lights on the document feeder - the three slashes indicates that the system power is "turned-on" and the correct system drivers have been installed. The green arrow verifies that the document page is correctly inserted and the red jam symbol will light if the page mis-feeds.



High-speed Formfeed Digital Scanner

Figure 4.5

## Laser Printer

The printer produces high speed hard copy of image or text files at a rate of fifteen pages per minute.

### Controls and Indicators:

- On/Off switch - a rocker switch located at the back left side of the unit.
- Control panel lights on the front of the unit indicate that the system power is "turned-on" and display a variety of other system messages: such as paper jammed, out of paper, toner low, etc., using universal symbols. A list of these symbols is printed on the top right of the unit along with a short explanation.

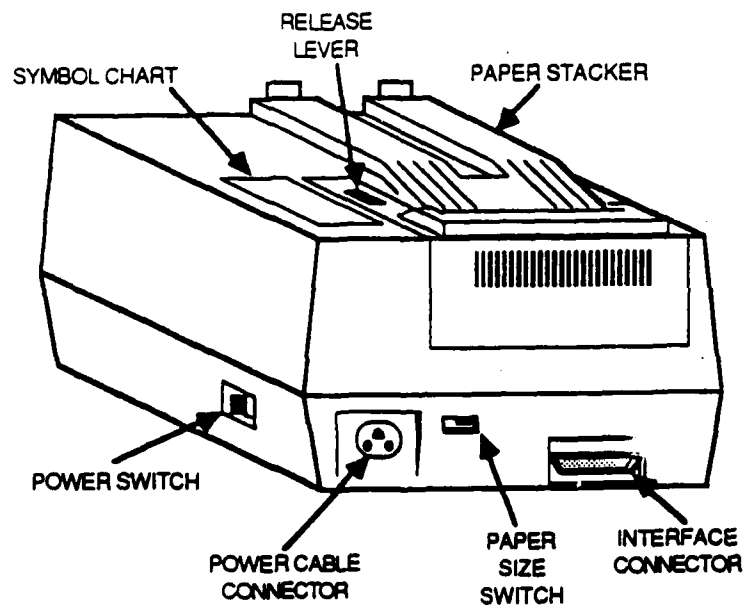


Figure 4.6

## BIBLIOGRAPHY

1. Bergerud, Marly and Jean Gonzales. Word/Information Processing: Concepts of Office Automation, 2d ed. New York, New York: John Wiley & Sons, Inc., 1984.
2. Bourke, Thomas A., "To Archive or Not to Archive: Is That Really The Question?", Library Journal, October 15, 1989.
3. Casady, Mona J. and Dorothy C. Sandburg. Word/Information Processing: A System Approach. Cincinnati, Ohio: South-Western Publishing Company, 1985.
4. Cornish, Edward - Editor, The Computerized Society: Living and Working in the Electronic Age. Bethesda, Maryland: World Future Society, 1984.
5. Dertouzos, Michael & Moses, Joel - Editors, The Computer Age: A Twenty Year View. Cambridge, Massachusetts: The MIT Press, 1981.
6. DeSafey, Frank. "Laser-Optic Technology: An Evolutionary Process." The Office, May 1986.
7. Diebold, John, Managing Information: the Challenges and the Opportunity. New York, AMACOM, 1985.
8. Donohue, James F., "CD-ROM Standards: The Making of High Sierra," Mini-Micro Systems, Vol. XX, pp. 56-57, December 1987.
9. Doyle David K., LTG, et al., "The Army's Information Management Challenge", Signal, May 1986.
10. Forester, Thomas - Editor, The Microelectronics Revolution. Cambridge, Massachusetts: The MIT Press, 1981.
11. Francis, Bob, "PC Back-up's Optical Understudy," Datamation, v.4, pp. 57-60, December 15, 1988.
12. Freeman, Raymond, "Optical Recording Comes of Age," Mini-Micro Systems, Vol. 18, No. 5, pp. 65-69, April 1985.
13. Harrison, Brad, "Write-Once Optical Worms Its Way Into Application Arenas," Hardcopy, v.8, pp. 53-58, 61-64, January 1988.
14. Hayes, John P., Computer Architecture and Organization, New York: McGraw-Hill Book Company, 1978.
15. Johnston, Christopher, The Microcomputer Builders Bible. Blue Ridge Summit, Pennsylvania: Tab Books, Inc., 1982.

16. Lesson, Majorie, Computer Operations: Procedures and Management, 3rd ed. Chicago, Illinois: Science Research Associates, Inc., 1987.

17. Levine, Ron, "Optical Storage Comes of Age," DEC Professional, v. 7, pp. 48-50, 52-54, 56-59, November 1988.

18. Lind, D.J., Optical Laser Technology, Specifically CD-ROM, And Its Application To The Storage And Retrieval Of Information, Master's Thesis, Naval Post Graduate School, Monterey, California, June 1987.

19. Martin, Edith W., Dr. "Artificial Intelligence and Robotics for Military Systems". DTIC Technical Report, May 84.

20. Page, Bruce, "LAN Optical Disks," Lan Magazine, Buyer's Guide, pp. 63, 65-66, 68, August 1988.

21. Preece, R. J., Dir., Automation for Executive Management Program. Pennsylvania: USAWC, 1988.

22. Riverbank, L., "Optical Filing Arrives," Federal Computer Week, v.2, pp. 27-28, 34, 36, 11 July 1988.

23. Sanders, Donald, Computers in Business. New York: McGraw Hill, 1981.

24. Shelly, Gray & Cashman, Thomas, Introduction to Computers and Data Processing. Brea, California: Anaheim Publishing Company, 1980.

25. Simmons, Al, "The Paperless Office - Dream or Vision," Government Technology, v.1, pp. 1, 6, 33, November/December 1988.

26. U.S. Department of the Army, Army Regulation 25-1: The Army Information Management Program. Washington: 1 Mar 86.

27. U.S. Department of the Army, Army Regulation 25-2: HQDA Data Architecture - Policy, Responsibilities, and Procedures. Washington: 10 Jul 1989.